

Biology & Community Intertwined: Example of Smallpox

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Biological & Social Factors Entwined through History

- Scourge
- Eradication
- Resurgence
- Current vaccination campaign



Ancient & More Recent History

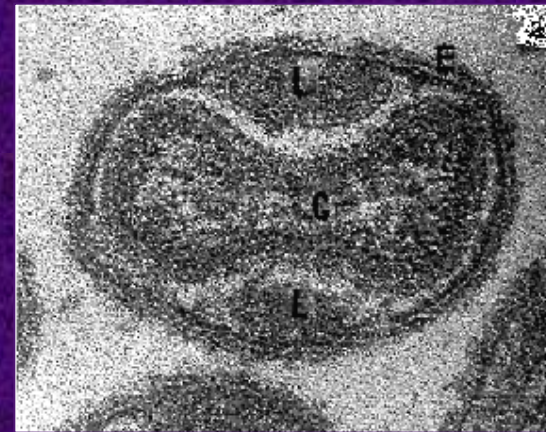
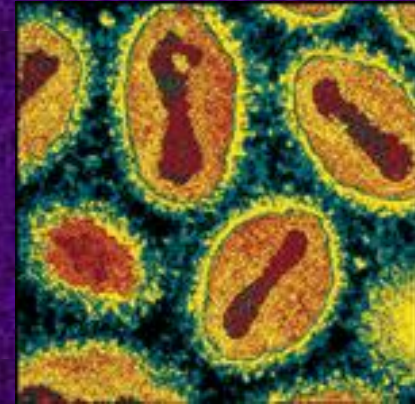


- Probably originated in Nile Valley >3000 years ago
- Killed Pharaoh Ramses V 1157 BCE
- Reached Europe 710 CE
- Conquistador Hernando Cortez brought to Central Mexico 1520
- Devastated Aztecs —estimated 3.5 million died within 2 years
- Arrived New England early 17th cen
- 18th Century European Plague — Killed reigning monarchs in 5 states

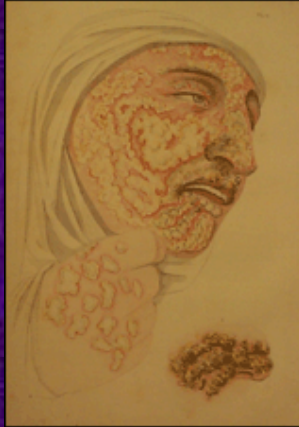


The Organism: Variola Pox Virus

- Large, brick-shaped, about size of small bacteria.
- Complex internal structure
- Surface covered with filamentous protein, so virus particles look like a ball of knitting wool
- Enclosed in an envelope derived from host cell membranes.

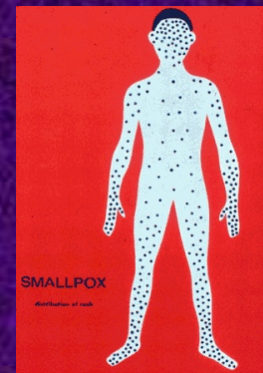


Disease Symptoms



Day 10

- Incubation: 1-2+ weeks. No symptoms. Not infective
- Pre-Eruption (days 1-3): flu-like symptoms
- Lesions, Papules, Pustules (days 4-10): increasingly infective via aerosol
- Scabbing, Crusting (days 11-14): somewhat infective until all scabs gone



Disease Outcomes



- Patient dead or recovered w/in month
- Historically killed 3-4 million per year
- Children & elderly most susceptible (10% of those born, died)
- Mortality rate nearly 30%
- Most survivors scarred

(~ 75%), many blind



Figure 1

Prevention & Inoculation

- Prior to “vaccine,” people were knowingly inoculated (variolated) to gain immunity
- People were also knowingly inoculated as means of germ warfare (bioterrorism)

Some ACCOUNT
Of what is said of
Inoculating or Transplanting
THE

Small Pox.

By the Learned
Dr. Emanuel Timonius,
AND
Jacobus Pylarinus.
With some Remarks thereon.

To which are added,
A Few *Queries* in Answer to the *Scruples*
of many about the *Lawfulness* of this Method.

Published
by *Dr. ZABDIEL BOYLSTONE.*

B O S T O N : Sold by S. GERRISH,
at his Shop in Corn-Hill. 1 7 2 1.



Isolation & Quarantine

- Isolation — segregation of the diseased
- Quarantine — preventative segregation of the exposed



- Requires trust
- Fear & anger toward the sick
- Counters urge to flee
- Messes with the mind
- Interferes with livelihood
- Wreaks havoc on social interaction

Smallpox Hospitals

Does disease adhere
to bounds of class
& privilege?



Smallpox Hospital Roosevelt Island, 1860



Smallpox Hospital Salem Willows, New England



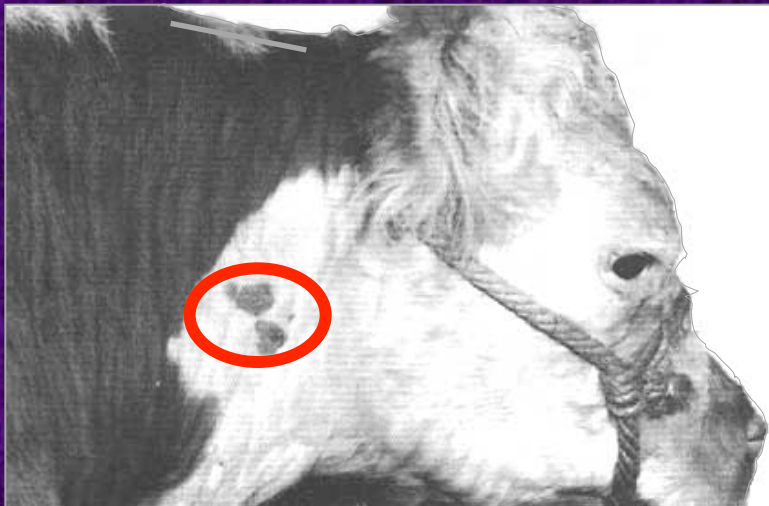
Smallpox Hospital Roosevelt Island, 1905

Vaccinia



Edward Jenner
1749-1823

- Dr. Edward Jenner discovered benefits of injecting people with *Vaccinia* virus (cowpox), 1796
- Vaccine from fluid scraped from sores on skin of infected calves
- Antibodies protect against smallpox as well as cowpox



Vaccines rank among top ten public health achievements of 20th century (CDC)

Vaccination

Smallpox Vaccine

James Phipps, 8-year-old son of Jenner's gardener, was inoculated with cowpox, given 8 weeks to develop antibodies for resistance, & then exposed to smallpox. Success! — No infection!

- Civil liberties
- Medical ethics



New York Times SATURDAY, APRIL 26, 1947.

Curb of Smallpox a 'Miracle,' Says City Health Commissioner

Officials See Little Chance of Extensive Outbreak of the Disease Now—5,265,000 Persons Vaccinated in Campaign

Health officials expressed pleasure yesterday that a threatened smallpox epidemic in New York had been "miraculously" curbed. With 5,265,000 persons vaccinated in the city since the first public report of smallpox here on April 5, the vaccination campaign was drawing to a close.

disease would have spread throughout the state and to other Since April 1, he said, 2 doses of vaccine have been distributed throughout New York State, exclusive of New York. Both Dr. Weinstein and I graham saw little chance extensive outbreak of an now. Dr. Weinstein pointed that the last case was reported

Increases Central Delay
RISE
HINTED
Briebs



NYC 1947—public health & politics

- Man infected in Mexico develops smallpox in NYC
- Massive free vaccination campaign reaches > 6 million in NYC within 2 weeks
- Outbreak controlled with minimal illness
- Neighboring counties charge NYC hoarded vaccine



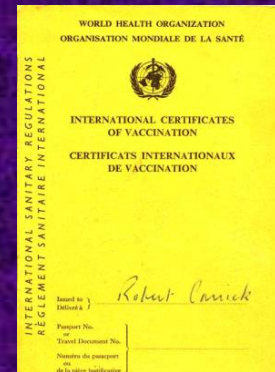
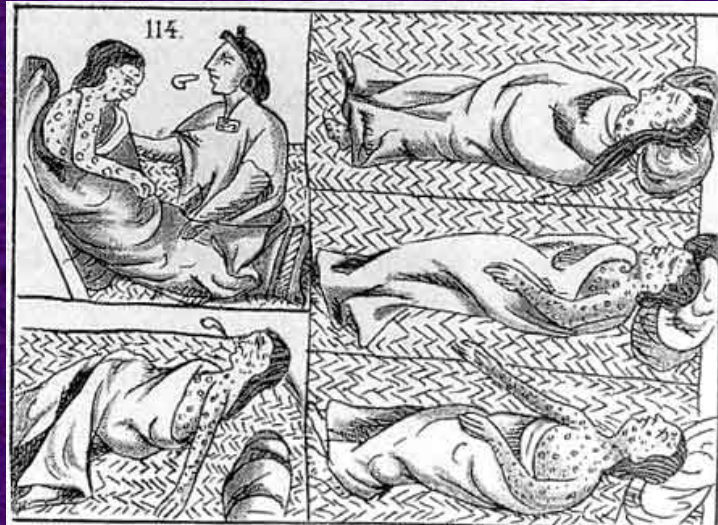


Stress & Mental Health

April 17, 1947: NYC police charge woman with illegal medical practice for posing as nurse to vaccinate 500 persons with water

April 18, 1947: woman is sent to Bellevue Hospital for observation (NYTimes Archives).

Trade & Travel



- Moves with people along routes of immigration, trade, & pilgrimage
- Trans-oceanic travel created global scourge
- Long understood to be highly contagious, especially in close quarters

Smallpox Eradication

- How was it done?
- Why was it successful?



Donald Henderson



William Foege

Trust

Fear

Coercion

Incentives

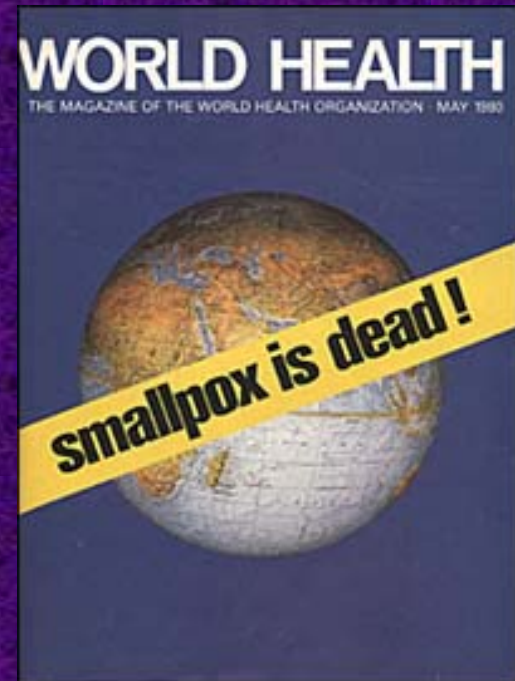
Political will

Self Interest

Investment of resources

Highly motivated public health team

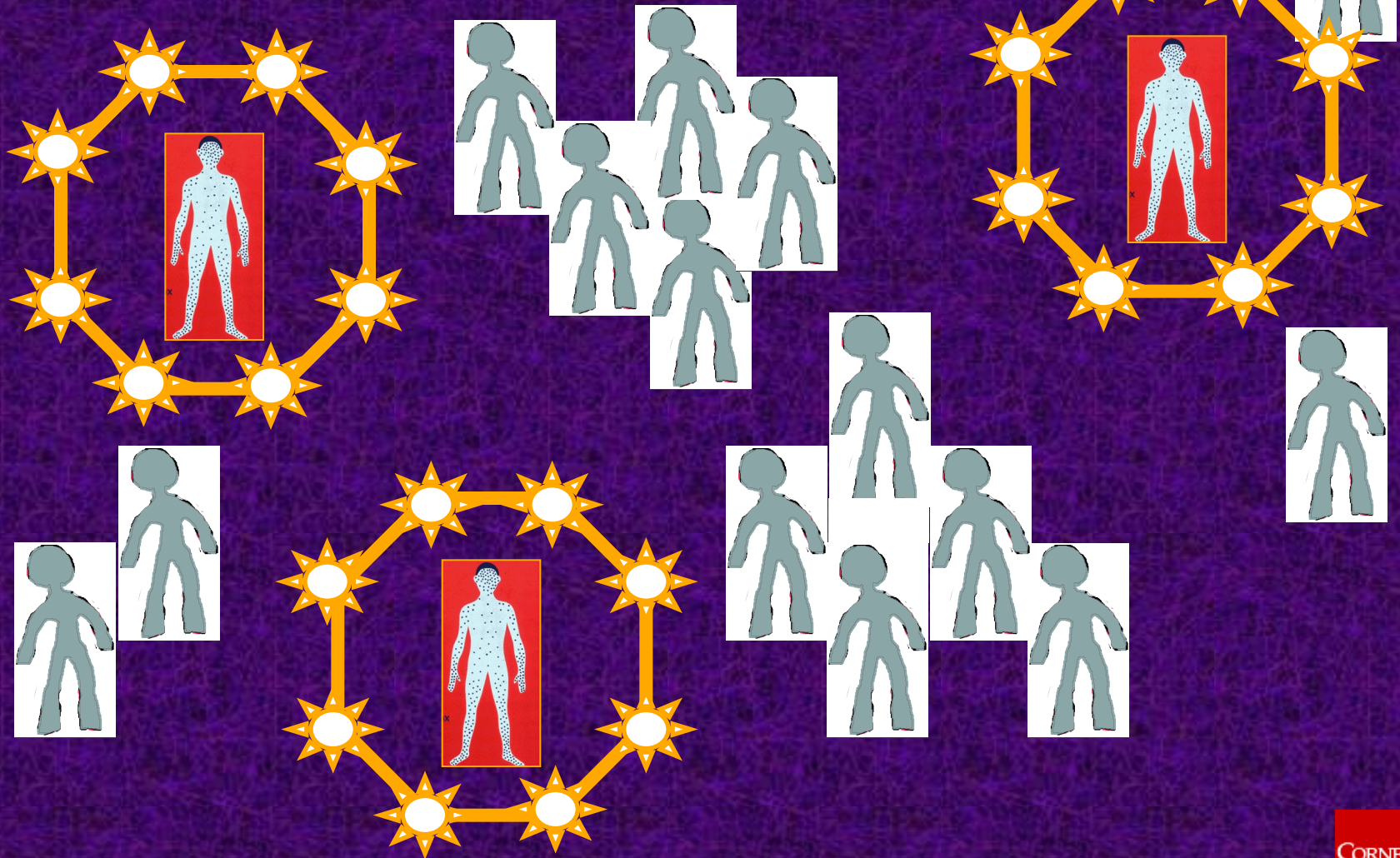
Sense of responsibility to community



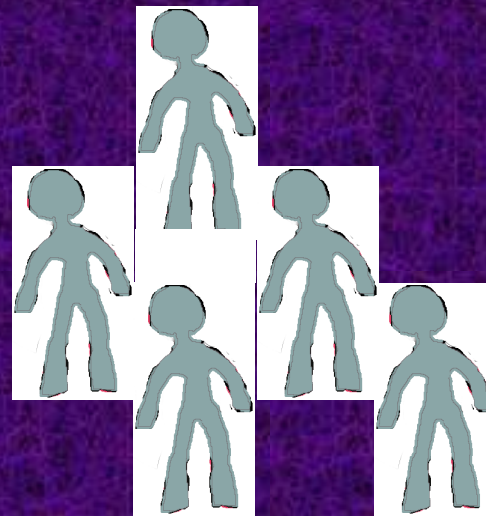
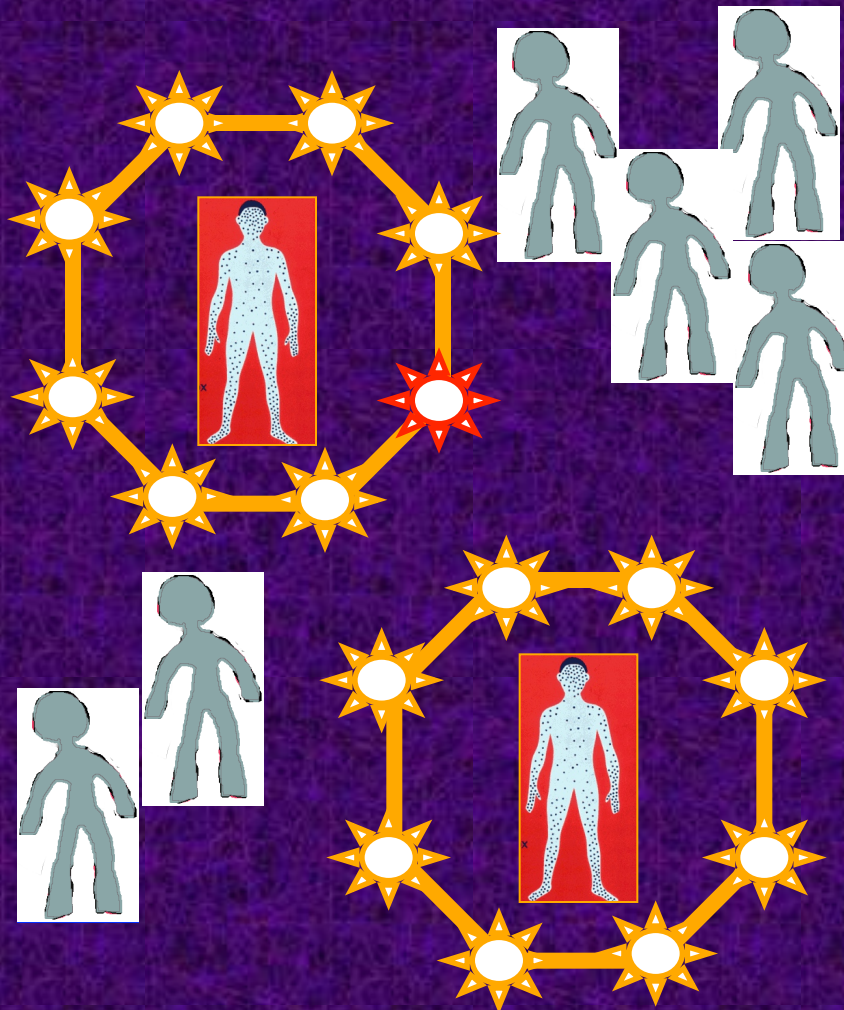
Mass Vaccination Strategy



Ring Vaccination Strategy Surveillance/Containment



Panic & Fear



Community (Ir)Responsibility



- Ali Maow Maalim
- Last known natural case of smallpox, Somalia, 1977
- As 21-year-old health worker evaded vaccine due to FEAR
- Exposed to smallpox, became ill, went to natural healer who rubbed spit on his body

Coercion

- Europe Jan 1972: smallpox-free
- Yugoslavia Feb 1972: smallpox re-introduced by cleric returning from pilgrimage to Mecca
- All transportation halted: entire nation quarantined
- Army vaccinated 18 million in 10 days

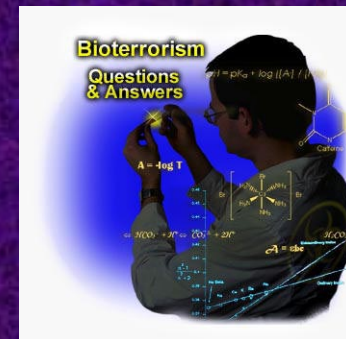
Outbreak successfully aborted
Civil Liberties trampled



Weaponizing Smallpox



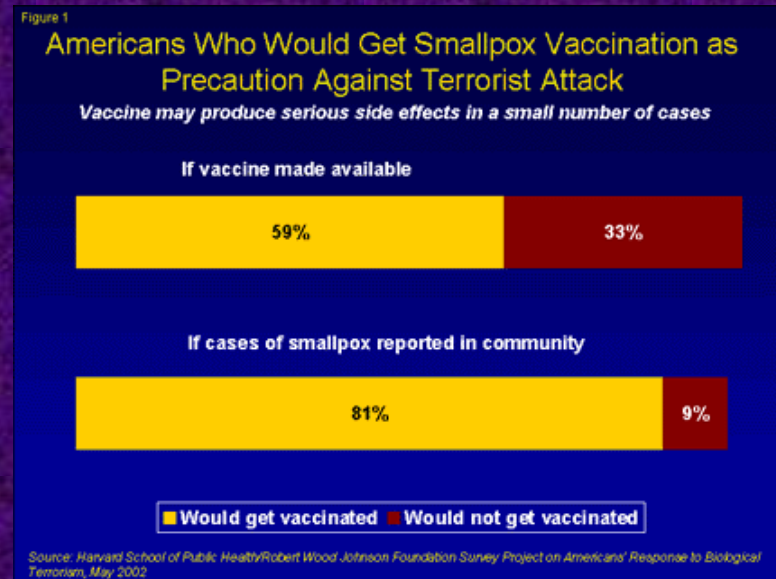
- Current attention to smallpox primarily because of threat of use in germ warfare
- Risk difficult to assess because uncertainty is huge



BioTerrorism

Harvard survey:

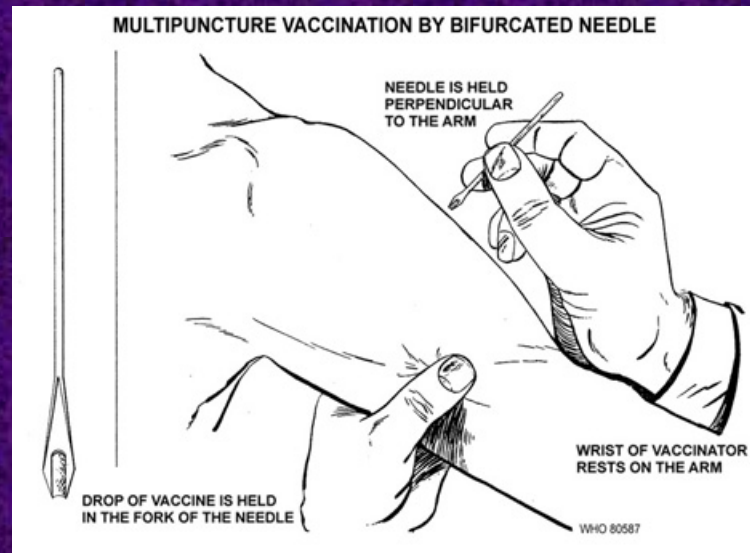
- US public does not trust any single spokesperson re: bioterrorism
- Nearly 3 in 10 African Americans believe there would be discrimination in treatment during an outbreak



(Source: Harvard Public Health NOW. June 2002)



Vaccination Campaign



Why were earlier vaccination campaigns seen as a “godsend” & this one thought to present unacceptable risk?

Mass Vaccination Strategy

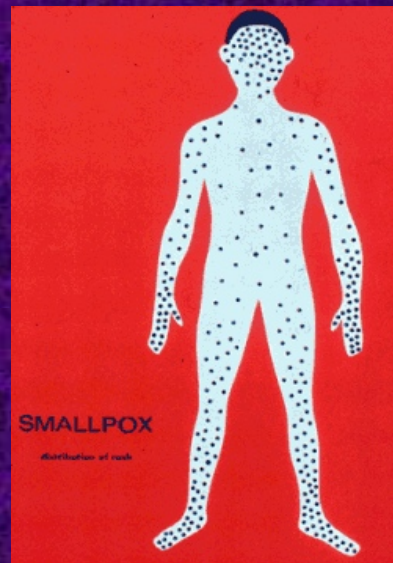


Lack of Trust & More

- Public understands social impacts & personal risk of vaccine
- Public does not trust they will be “taken care of”
- Population at greater health risk from vaccine than before: older, more are immuno-compromised
- Lack of trust in government vaccination strategy
- Comparative Risk: Abstract risk of smallpox vs. known risk of vaccine side-effects
- Germ Warfare is difficult & terrifying to contemplate
- Infectious disease doctors know how to treat smallpox.
- Vaccine effective up to 4 days after exposure



“We have a system where people dealing with disasters don’t have a clue about what the public is thinking”



(Source: Harvard Public Health NOW. June 2002. Quoting Dr. Robert Blendon, Director Harvard Program on Public Opinion Health and Social Policy)